

**Claims**

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1. Method for the detection of molecules or molecule complexes,
- 5 - a sample to be measured being brought into contact with an ultra-microelectrode arrangement which has at least two electrode structures that are arranged relative to one another such that the distances between the various structures lie in the ultra-micro range,
- 10 - an alternating electric field being produced by application of an electric potential, and
- the changes in current or potential, which are caused by species present or created in the sample to be measured, being measured.
- 15 2. Method according to claim 1, in which the field changes are measured using impedance spectroscopy.
3. Method according to claim 1 ~~or 2~~, in which the detuning of the electric field, which is caused by species present or created in the sample to be
- 20 measured, is measured independently of time or as a function of time by measuring the capacitive and/or resistive components and/or the phase angle.
4. Method according to ~~one of claims 1 to 3~~, in which the molecules or molecule complexes are detected
- 25 by virtue of their binding or attachment or diffusion.
5. Method according to ~~one of claims 1 to 4~~, a plurality of electrode arrangements being stacked, and

the crossover points being insulated from one another by insulation layers, and the measurements being taken sequentially, in parallel or simultaneously.

a 6. Method according to ~~one of claims 1 to 5,~~  
5 characterized in that the alternating electric field is superimposed or excited with a direct-current component.

7. Method according to claim 6, amperometric oxidations or reductions or redox recycling of  
10 molecules having electrically active groups or of redox mediators being measured in the sample to be measured.

a 8. Method according to ~~one of claims 1 to 7,~~ in  
which species to be measured self-assemble on the active electrode surfaces and are measured in the bound  
15 state.

a 9. Method according to ~~one of claims 1 to 8,~~ in  
which molecules are bound on the electrode surfaces by electropolymerization and are measured in the bound state.

a 10. Method according to ~~one of claims 1 to 9,~~  
20 molecules being fixed in the gaps between electrodes and/or on the entire surface of the electrodes by physical or chemical binding, and being measured.

a 11. Method according to ~~one of claims 8 to 10,~~ a  
25 first fixed molecular layer containing a bonding group which, itself or through a difunctional reagent, binds a second molecular layer, which may in turn bind

others, and these events or their reverse being measured.

12. Method according to claim 11, in which the first molecular layer contains complexing groups which bind their complementary binding partner these events or their reverse being measured.

13. Method according to claim 11 ~~or 12~~, in which the first molecular layer is a deoxiribonucleic-acid or ribonucleic-acid component which binds a complementary molecule strand by hybridization, this event or its reverse being measured.

14. Method according to claim 13, in which the molecular arrangement binds a further nucleic acid component or a complexing or intercalating molecule, and this event or its reverse is measured.

15. Method according to ~~one of claims 1 to 14~~, in which the molecules or molecule complexes are detected in that they differ by size and/or type.

16. Method according to ~~one of claims 1 to 15~~, in which the active electrode surfaces consist of gold, platinum, iridium or other noble metals, of carbon materials or of other conductive materials or of combinations thereof.

17. Method according to ~~one of claims 1 to 16~~, in which the electrodes are applied to, or are incorporated in, silicon compounds, glass, ceramic, organic polymers or other insulating materials.

a 18. Method according to ~~one of~~ claims 1 ~~to 17~~, in which, by coating on a substrate or embedding in such, the electrodes are arranged as bands or strips or circular structures or interdigital arrangements in the  
5 micrometer or submicrometer separation from one another.

a 19. Method according to ~~one of~~ claims 1 ~~to 18~~, in which at least some of the electrodes are arranged as multilayer structures that are insulated from one  
10 another and, if appropriate, intersect.

a 20. Method according to ~~one of~~ claims 1 ~~to 19~~, in which the active electrode surfaces can have direct and/or alternating current applied to them, individually or in groups, via insulated supply leads  
15 and/or electronic components.

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